Aura Science Team Meeting

Boulder, Colorado

September 11 - 15, 2006

EOS Aura
Mission Operations Working Group (MOWG) Report

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Mission Operations Working Group (MOWG)

- Members are responsible for the health and safety of the Aura satellite (spacecraft bus and instruments) to enable science
- Established in 1997 during the Aura Science Team meeting in West Virginia

MOWG Meeting Attendees

- **HIRDLS**: J. Barnett, J. Craft, C. Hepplewhite, J. Loh
- **MLS**: D. Cuddy, D. Miller
- **OMIS**: J. Claas, O. Aulamo, M. Hopkins, Phillip Durbin
- **TES**: R. Murdock
- **GSFC Earth Science Mission Operations**: A. Kelly, C. Gomez
  - **EOS Flight Ops Team**: J. Purcell
- **GSFC ESDIS**: K. Michael, A. Hall, B. Krupp
- **Raytheon (EMOS)**: D. Solvason, U. Mroz, D. Demaree, K. Stich, E. Reeves

EOS AURA Mission Operations Working Group Meeting

Boulder, Colorado, September 12, 2006

13:00	Greetings/Introduction/Agenda Review	All
13:15	EOS Aura Status	A. Kelly
13:30	HIRDLS	J. Craft/J. Barnett/ C. Hepplewhite
13:50	MLS	D. Miller/D. Cuddy
14:10	OMIS	J. Claas
14:30	TES	R. Murdock
15:00	**MMS IST Redesign and New Operations Concept**	**Raytheon**
15:40	EDOS Update	C. Gomez
16:00	**SSR Auto Operations Concept**	**A. Kelly**
16:30	Summary/Actions/Next Steps	
17:00	Adjourn	

Topics

- Aura Mission Operations Status Summary
- Key Discussion Item:

  Auto Operations Concept for Dumping the Solid State Recorder (SSR)
- Control Center Re-engineering Activities
- Aura's Neighborhood

Aura Operations Status Summary

- **Spacecraft: GREEN**
  - **all subsystems performing well**
  - **no anomalies in the past year**
- **Instruments: GREEN**
  - **Instrument teams shared their experiences and lessons learned in the past year, notably in handling anomalies on MLS, OMI, and TES. (HIRDLS did not experience an anomaly).**
  - **HIRDLS presented the rationale for their periodic pitch maneuvers (spacecraft pitches down, HIRDLS pitches up).**
- **Data Capture/L0 Processing Status: GREEN**
  - **SSR Data Capture to 07/31/2006: 99.67 %**

Key Discussion Item

Proposed Solid State Recorder (SSR) Auto Operations Concept

- **Purpose: To reduce operations cost; eliminates the need to manually command the SSR dump every orbit (14 - 15 orbits per day)**
- **Benefits:**
  - **Saves $$**
  - **Enables data downlink and capture even when there is no communications link to the spacecraft**
- **Disadvantages:**
  - **Loss of one packet (engineering and/or science) every orbit (MLS, OMI, TES). HIRDLS not affected.**
    - **EDOS is investigating a possible solution.**
  - **Potential data loss if ground station has unanticipated problems**

Key Discussion Item, continued

Proposed Solid State Recorder (SSR) Auto Operations Concept

- **Need feedback from the Aura and Aqua Science Teams--Is this concept acceptable??**
- **If not,**
  - **Science Teams must provide quantitative and qualitative impact on science**
    - **e.g., Will this impact the Science Teams' ability to meet mission success requirements and/or produce standard data products?**
  - **Any other impacts?**

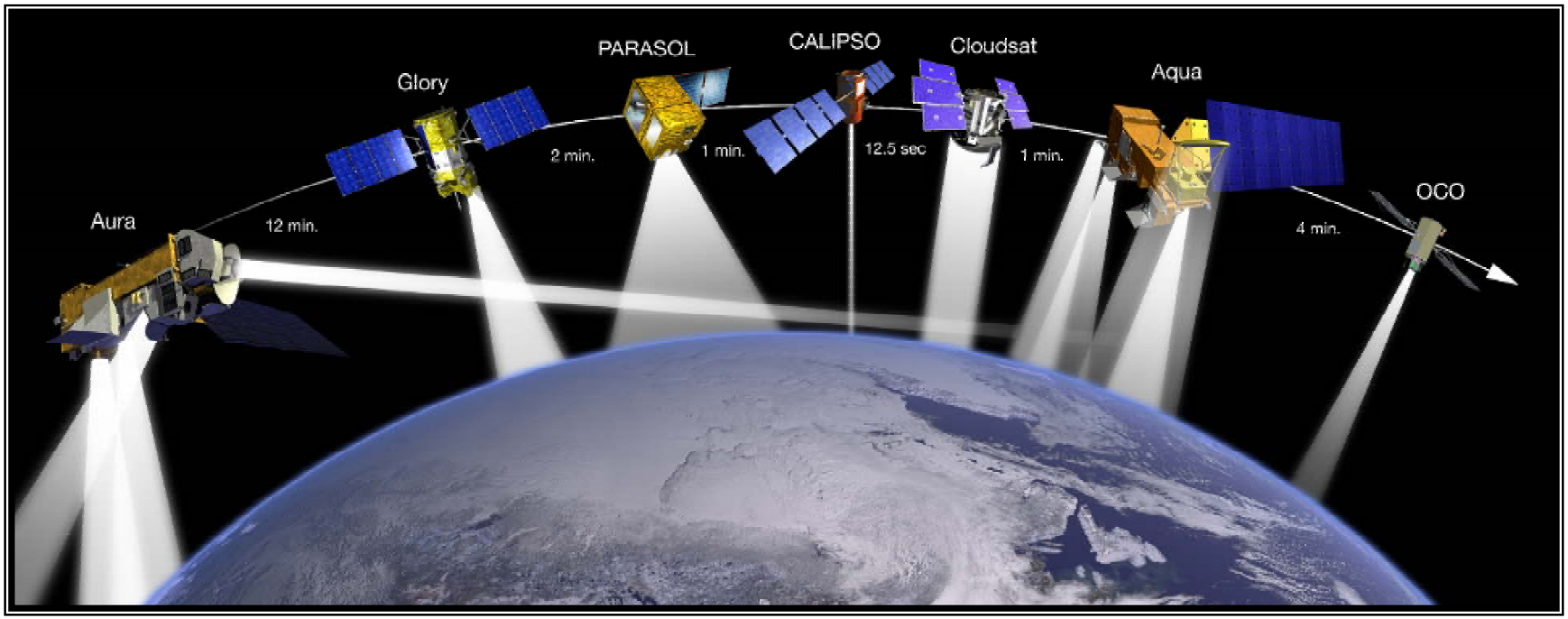
Control Center Update

Control Center Re-engineering Efforts

- Purpose: To improve the security at the EOS control center and at the remote instrument operations team (IOT) facilities; and to eliminate the need for control center software at the instrument facilities
- Discussion of system changes provided by the Raytheon development team/Denver
  - Will require a new PC for mission scheduling at the instrument facilities
  - Additional firewalls and log-ins
- IOTs now understand the proposed changes to their scheduling interface with the control center

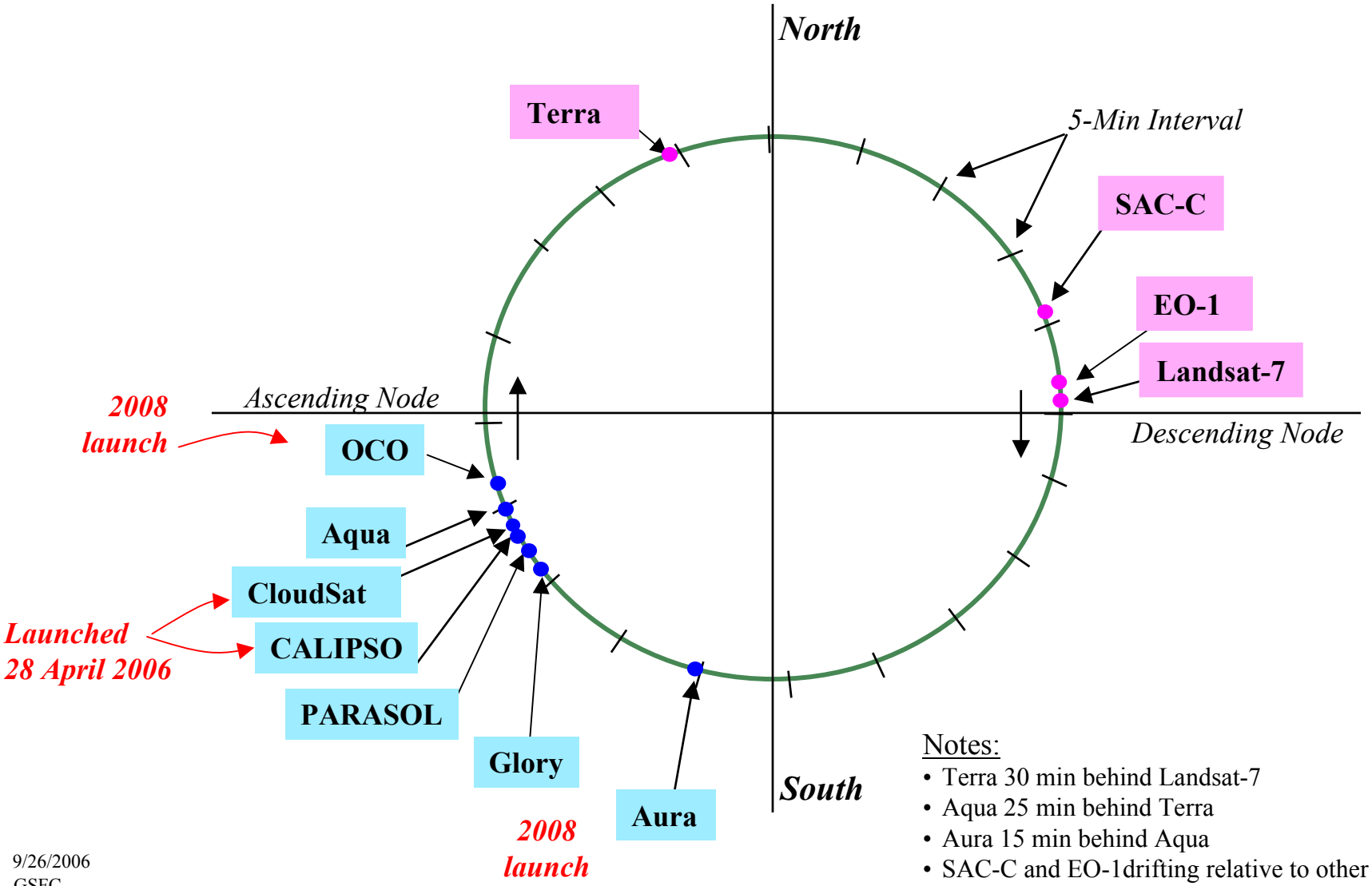
Aura's Neighborhood

Earth Science Afternoon Constellation (A-Train)



- **CloudSat and CALIPSO were launched 28 April 2006**
  - **-- joined the Afternoon Constellation May 31.**
- **There are now 5 on-orbit satellites in the "A-Train".**
- **Glory planning to be ~4 minutes behind Aqua**
- **OCO and Glory missions will launch in late 2008**
- **All A-Train satellites currently performing Inclination Adjust Maneuvers**

Relative Positions of Satellites (one orbit)
Earth Science Morning and Afternoon Constellations
(From Ground Station Perspective)



Notes:

- Terra 30 min behind Landsat-7
- Aqua 25 min behind Terra
- Aura 15 min behind Aqua
- SAC-C and EO-1drifting relative to other satellites

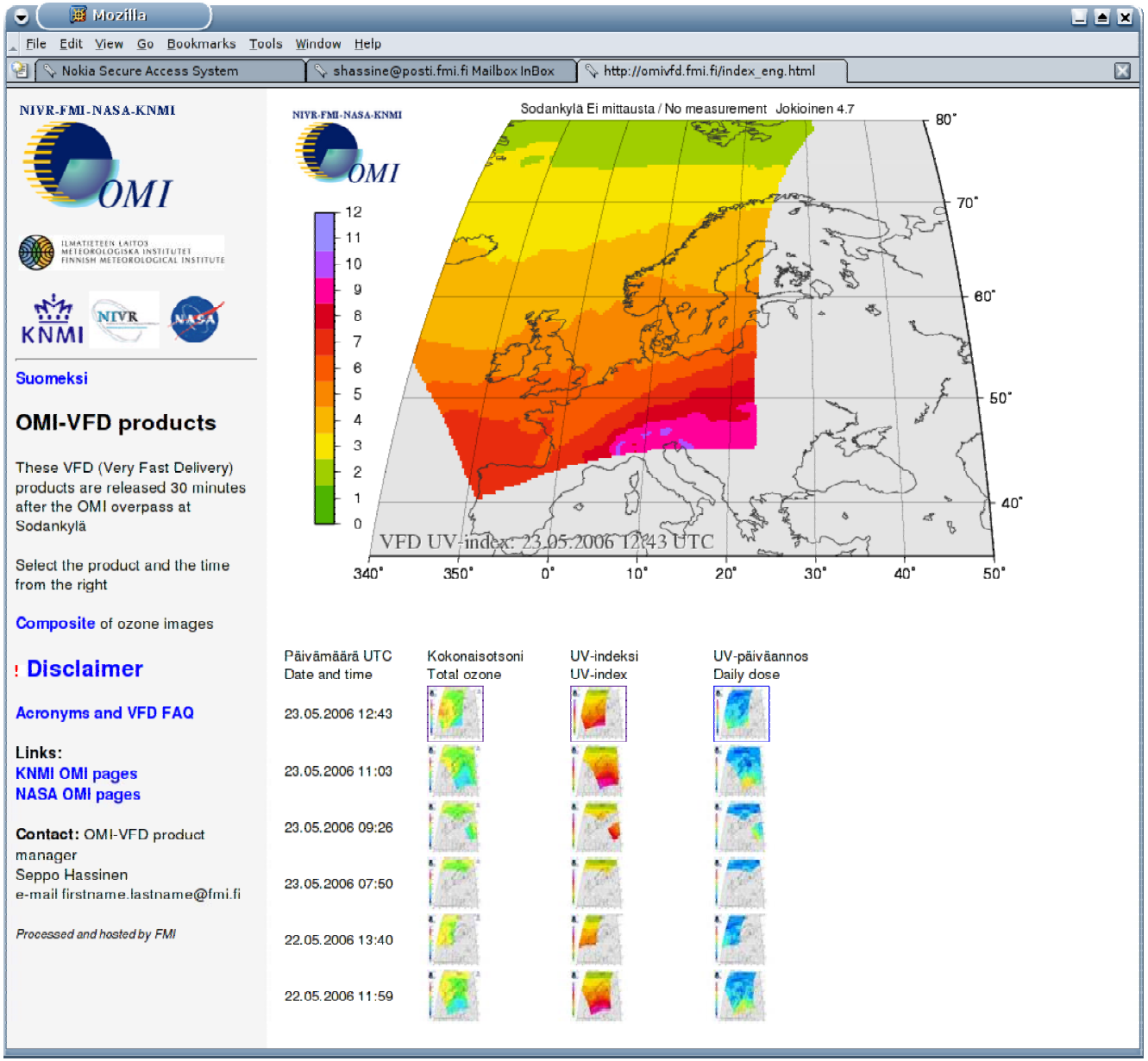
A-Train Constellation Science?

- The A-Train Mission Operations Working Group (MOWG) has worked hard for the past 3.5 years to ensure safe constellation operations.
- GSFC system monitors the constellation and provides warnings regarding regarding unsafe operations.
- **WHAT will the science teams do to reap the benefits of coincidental science from the A-Train?**
  - **Coordinate A-Train Science Teams: Form A-Train Science WG?**
  - **Constellation science data products: Address the need for an A-Train Data Depot (see S. Kempler's poster)**
  - **European A-Train Data Depot is being developed? Workshop planned for Fall 2007 in Toulouse, France**
  - **HQ Contacts: D. Anderson, H. Maring, S. Volz**
    - **Note: M. Schoeberl is the designated GSFC A-Train Project Scientist**

Thank you for your attention.

Please email additional questions or comments to: angelita.c.kelly@nasa.gov

Additional Information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OMI-VFD products
These VFD (Very Fast Delivery) products are released 30 minutes after the OMI overpass at Sodankylä
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End of Mission Requirement
(Fuel needed to ensure re-entry in 25 years)

S/C	Flux level	Perigee Height (Km)	Minimum Fuel Required (kg)	Current Fuel Level (kg)
Aqua	Low	433	125	179
Aqua	Nominal	491	95	
Aura	Low	438	114	191
Aura	Nominal	491	95	

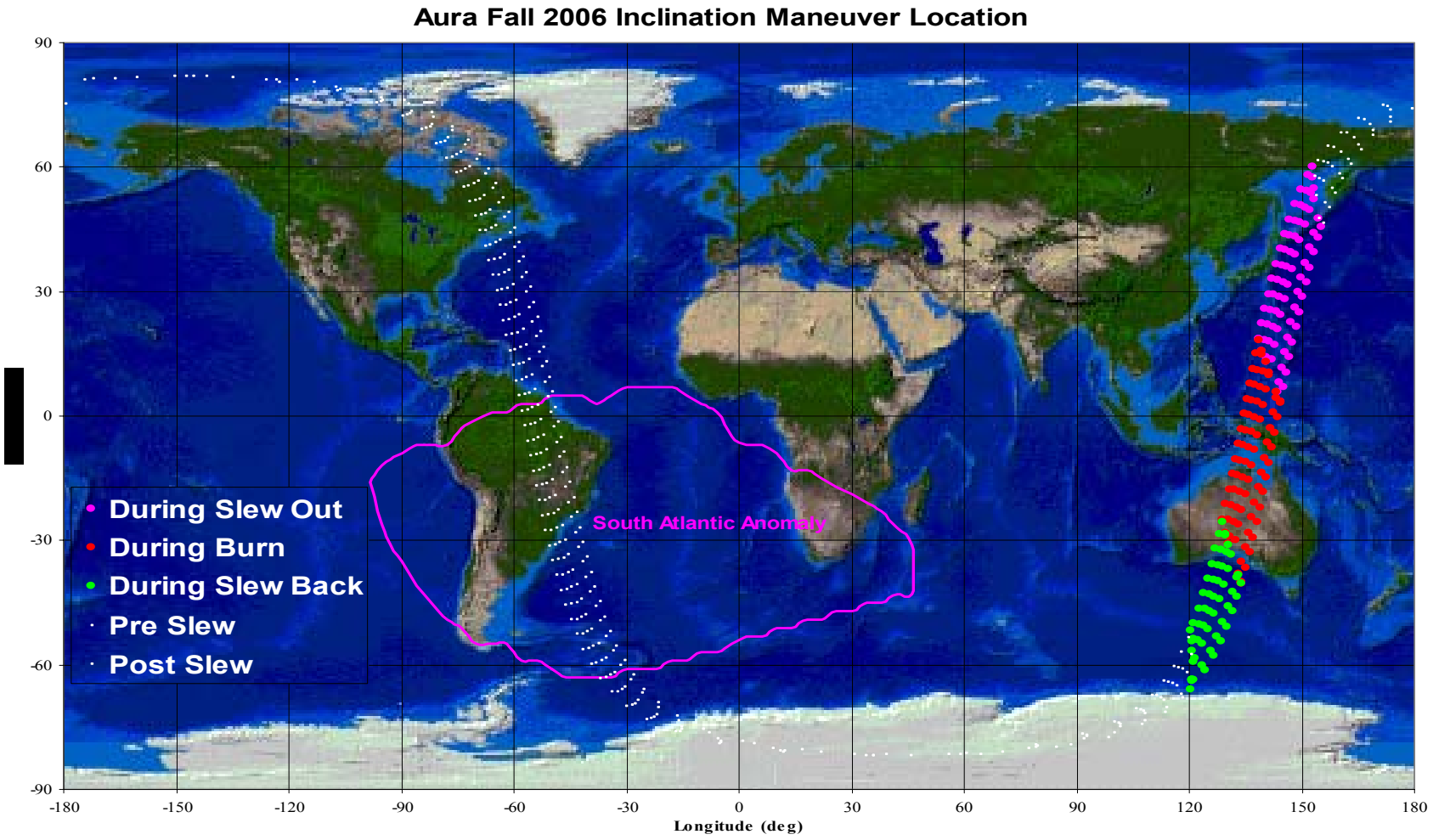
Worst case analysis for Aura indicates minimum of 8-10 years of remaining life – saving 114 kg of fuel for EOM

ESMO Flight Dynamics analysis indicates Aura has sufficient propellant reserves to last until 2015

Old Spacecraft Anomalies

- EPS ARE–3C not supplying power to S/C Bus
  - Started January 12, 2005: Degraded to zero output in 4 orbits
  - No interruption to S/C or Instrument Operations
  - ESMO Anomaly Resolution Team Formed
    - NGST, AETD, FOT, MD
  - ARE-3C taken off-line March 10, 2005
  - GSFC/AETD Anomaly Review Board Final Report
    - Most Likely Cause: **Disengaged Solar Array connector**
    - Believed to be an isolated workmanship related problem
    - **Impact: Available End of Life (EOL) power margin dropped from 24% to 17%**
    - **No impact to operations or 6-year life expectancy**

Maneuver Locations



Propellant Usage